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EXAMINER

GORDON, BRIAN R

ART UNIT PAPER NUMBER

1743

DATE MAILED: 11/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/619,768

Applicant(s)

FUKUIZUMI ET AL.

Examiner

Brian R. Gordon

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 February 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 13-40 is/are pending in the application.
- 4a) Of the above claim(s) 1-12 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 13-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 7-19-00 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 16, 2003 has been entered.

Specification

1. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Response to Arguments

2. Applicant's arguments filed February 28, 2003 have been fully considered but they are not persuasive.

As to the 112 rejection, applicant's arguments state figure 2 provides evidence that the preparation tank is an element of the dissolution unit. As stated by applicant reference numeral 22 indicates a collection of elements, which implies that the dissolution unit includes all of the elements under the lead line, including the supply lines, valves, etc. As recited in the claims there is a chemical solution preparation apparatus comprising a dissolution unit, discharge control unit, and etc. However this

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recitation contradicts applicant's arguments on page 15 paragraph (a) that states, "the **entire apparatus** is the dissolution unit." This means that the chemical solution preparation apparatus (in the preamble) and the dissolution unit are the same device. If the two are one in the same then the device cannot comprise itself. The claim recites: A chemical solution preparation apparatus (which is the dissolution unit) comprising: a dissolution unit. This cannot exist. It appears as if the claim should read a dissolution apparatus comprising:..... If the dissolution unit is the entire device as stated by applicant then the dissolution unit comprises or includes the preparation tank. The entire device cannot be connected to an element included within the entire structure.

Applicant's arguments are contradictory with that which is claimed for paragraph (b) recites the dissolution unit comprises the preparation tank (which the examiner agrees with) and the claim recites a dissolution unit connected to a preparation tank as to indicate the dissolution unit and the preparation tank are separate elements when in fact as stated by applicant the preparation tank is an element of the dissolution unit.

Paragraphs (a) and (b) of applicant's arguments are contradictory paragraph (a) states "the **entire apparatus** is the dissolution unit" and paragraph (b) states the apparatus comprises the dissolution unit. If the entire device is the dissolution unit then that means element 11 and element 22 are the same. If not, then what is the difference between element 11 and its components and element 22? What is the difference between the dissolution unit and the preparation tank? What comprises each element 11, 22, and 21?

As to paragraph (c) in the claim it is recited that the dissolution unit is **connected** to the preparation tank, indicating two separate elements not the dissolution unit comprising a preparation tank.

It appears as if the confusion is derived from understanding what is the difference between the entire device and its components. In the specification on page 1 reference number 1 (which is missing from the drawings) references the chemical solution preparation apparatus (as stated in the preamble). The chemical solution preparation apparatus comprises a chemical solution refinement device 11 (which appears to be what applicant is intending to claim). The claims should use consistent terminology as the specification. On page 5, line 30 it is stated that the refinement device includes a preparation tank, a dissolution unit 22, and etc. It appears that the entire device is the refinement device not the dissolution unit.

The drawings do not show a dissolution unit 22 **connected** to a preparation tank 21.

As to paragraph (d) the examiner agrees that the preparation tank is an element of the entire apparatus. However applicant as stated the entire apparatus is the dissolution unit and once again the entire device **cannot be connected** to an individual component that has been said to be included in the entire device. In the event that the entire apparatus as in Figure 2, is considered the dissolution unit, then the dissolution unit does comprise a preparation tank.

However, page 5 line 35, recites "refinement device 11 includes a preparation device tank 21, a dissolution unit 22, a gas discharge control unit 23, a liquid discharge

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control unit 24, a cooling unit 25, and a supply unit 26". This teaching does not state that the dissolution unit comprises/includes preparation tank 21. It moreso implies that the elements are distinct and different but are all included in the refinement device.

On page 7, lines 21-27, the components of the dissolution unit are listed. The list **does not** include a preparation tank or gas supply.

Applicant's arguments on pages 17-22, state that the instant claims are distinguished over the cited prior art for the prior art does not disclose the technical feature of "simultaneously performing a gas dissolving operation and a gas/liquid discharging operation to increase the purity of a chemical solution removing impurities from a preparation tank" (page 18) and "removing impurities from the preparation tank by discharging an adjusted amount of the undissolved gas and/or a predetermined amount of the chemical solution while preparing the chemical solution by dissolving a stock gas to a stock liquid". The examiner asserts that arguments are not commensurate in scope with that of the claims. The claims are directed to an apparatus comprising certain elements. The claims are not process claims as it appears as applicant is attempting to argue. It is not required that the prior art teach the same intended use as given by applicant. The objective and function is considered intended use.

It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Masham, 2 USPQ2d 1647 (1987).

If applicant intends for the function of the elements to have weight it is suggested that applicant use means plus function language within the claims.

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the dissolution unit connected to a preparation tank a gas collection unit connected to the dissolution unit must be shown or the feature(s) canceled from the claim(s). No new matter should be entered. The entire apparatus, gas dissolution unit 22 is not shown connected to any other elements in any of the figures.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 1. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 13-31, 34-38 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter

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which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The claims are have been amended to recite a dissolution unit connected to a preparation tank. There was no such disclosure within the pre-amended specification or claims.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 13-14, 17-19, 24, 29, 32, and 33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claims 13, 17, 18, 19, 24, 32, and 39 rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the relationship between the discharge control unit, liquid discharge control unit, and the remaining elements. Where are the elements located or arranged in relevance to each other? How are the gas supply and liquid supply lines related to the dissolution unit?

Claim 13, 17-19 recites "a liquid discharge control unit for discharging a predetermined amount of chemical solution from the dissolution unit" (not preparation tank). It is unclear what is the difference between the dissolution unit and the

preparation tank. As it appears in Figure 2, it appears as if the entire apparatus is the dissolution unit (22) that comprises the preparation tank (21). Or from the claims, the apparatus comprises the dissolution unit (22) and a preparation tank 21; in this case it is not clear how the dissolution comprises the preparation tank for this is not described as such on page 7 line 21-34 and furthermore, the preparation tank was claimed as an element of the apparatus (not the dissolution unit, claim 14) in the original claims.

As to claim 14, applicant's specification recites (on page 6, lines 2-3) "chemical gas is supplied to the dissolution unit 22 from a gas cylinder 28." There is no indication that the dissolution unit incorporates the gas supply unit.

Claim 14 also recites that the preparation apparatus comprises a preparation tank which implies that the preparation tank is a separate element from the dissolution unit which contradicts applicants remarks which state "the dissolution unit 22 includes the preparation tank 21" (page 8, paragraph (ii)).

6. Claim 15 recites the limitation "the gas supply unit" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claims 17-19, and 24 recite "wherein one of the gas discharge control unit and the liquid discharge control unit is operated substantially the same time as the dissolution unit" as indicated in applicant's arguments the dissolution unit includes a collection of elements, however if the dissolution unit includes the discharge units then this would mean that in general when either of the discharge units are in operation then essentially the dissolution unit is in operation because the discharge units are elements of the dissolution unit.

In applicant's arguments on page 16, paragraph 4, applicant asserts that the discharge unit is a separate element from the dissolution unit. This is contradictory to the applicant's previous arguments, for applicant has stated the entire device in Figure 2 is the dissolution unit, therefore all of the elements within the figure are elements included within the dissolution unit. Furthermore page 7, line 21 states "dissolution unit 22 includes a controller 31" and page 9, line 24 states "gas discharge control unit 23 includes the controller 31". As such the examiner hereby asserts that when operating the controller 31 means that both the discharge control unit and dissolution unit are operated.

It is unclear what is meant by the phrase "operating the dissolution unit" for applicant has stated that the dissolution unit is a collection of elements; as such by operation one of the collection of elements essentially means that the dissolution unit is operating.

Claim 33 fails to further structurally limit the device. The claim is moreso directed to process limitations. It appears as if applicant is attempting to apply the device comprises a means for heating (where?) the chemical solution and a gas bubbler (where?).

It appears as if claim 35 should be amended to "..... and wherein the apparatus further comprises a means for measuring the weight of the chemical gas....." As presently drafted the phrase is directed to a process limitation.

Claim Rejections - 35 USC § 102

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5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 13-15, 23, and 39 are rejected under 35 U.S.C. 102(b) as being anticipated by Nakajima et al.

Nakajima et al. discloses a device that includes a container adapted to treat the substrate with the liquid chemical agent, the container having an inlet and an outlet; circulation means connecting the inlet and the outlet of the container, and having a circulation pump; a liquid reservoir; a gas supply; and a gas-liquid mixer for synthesizing the liquid chemical agent connected to the liquid reservoir and gas supply, and having an outlet for the liquid chemical agent connected to the circulation means. The device includes chemical concentration detection means disposed in the circulation means; and means for regulating the mixing ratio of the gas to the liquid connected to the Chemical concentration detection means and the mixer (concentration adjusting means).

The chemical concentration detection means may be a sensor for detecting a pH of the liquid chemical agent. Alternatively, the chemical concentration detection means includes a light source arranged to emit a light beam through the liquid chemical agent; means for detecting the intensity of the light beam passing through the liquid chemical agent; and means for correlating the intensity of the light beam detected with the concentration of a specific chemical in the liquid chemical agent.

The device comprises a pure water supply system 7 that includes a pure water supply 30 (preparation tank for storing a liquid) and pipe conduit 11 and gas supply system with conduits 41, 51; gas supply 40, 50; gas regulators 43,53. The device further comprises mixing unit 17 (dissolution unit), gas outlet 17d that has an electric motor operated valve 18 that is capable of controlling the discharge of undissolved gas, and liquid outlet 17d that comprises valve 19 (discharge control units).

7. Claims 13-15, 20, and 39 are rejected under 35 U.S.C. 102(b) as being anticipated by Nelson et al. US 5,971,368.

Nelson et al. disclose a system to increase the quantity of dissolved gas in a liquid. System (1), as illustrated, is adapted for the production of ozonated water, however, the principles of the present invention are applicable to any liquid/gas solution. System (1) generally comprises a pressurized vessel (2)(dissolution unit) having an internal volume (30) within which a body of liquid (31) is contacted with a gas (32). Gas (32) is dissolved in liquid (31) as a result of such contact. Liquid (31) is supplied to pressurized vessel (2) through liquid inlet port (33) at the top of pressurized vessel (2), and gas (32) enters the pressurized vessel (2) through bubbler (34) positioned at the bottom of pressurized vessel (2). Thus, gas (32) percolates upward through pressurized vessel (2) while liquid (31) generally flows downward. Such counterflow of gas (32) and liquid (31) provides a relatively long period of contact between gas (32) and liquid (31), thereby facilitating the dissolution of gas (32) in liquid (31). Pressurized vessel (2) is connected to liquid source (4) by liquid conduit (35) for supplying the desired liquid to the pressurized vessel (2). In a preferred embodiment, liquid source (4) supplies

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ultrapure deionized water through liquid conduit (35) to pressurized vessel (2).

Optionally, liquid conduit (35), may comprise liquid pressure regulator (20) and liquid pressure gauge (21) to control the pressure of liquid (31) flowing to pressurized vessel (2). Flow from liquid source (4) into pressurized vessel (2) is further preferably controlled by liquid valve (22) that is responsive to liquid sensing device (3). Liquid sensing device (3) is positioned on pressurized vessel (2) such that liquid sensing device (3) is capable of detecting an amount of liquid (31) in the pressurized vessel (2). In this manner, the transport of the liquid from the liquid source (4) to the pressurized vessel (2) may be controlled in response to a signal from the liquid sensing device (3). Ozone is supplied to pressurized vessel (2) through pressurized gas conduit (18). Since ozone has a relatively short half life, it is preferred that it be supplied on demand from, e.g., ozone gas generator (5). However, any ozone source capable of maintaining a generally continuous flow of ozone may be used. In the embodiment shown, the ozone gas generator (5) is of the type that uses electricity to generate ozone from oxygen. Oxygen is supplied from an oxygen gas facility (10) to ozone gas generator (5) through conduit (36). Conduit (36) comprises a precursor supply pressure regulator (15), a precursor supply pressure gauge (11), a precursor supply 2-way valve (12) and a precursor supply mass flow controller (13). These fixtures are included to control the flow rate of oxygen. Cooling media (14), preferably water, is supplied to the ozone gas generator (5) through a cooling media valve (16). Cooling media (14) flows through ozone gas generator (5) and exits through cooling media drain (38).

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The device also comprises gas outlet conduit (39) and liquid outlet (6). Pressurized gas outlet conduit (39) is coupled to the pressurized vessel (2) such that undissolved gas can be withdrawn from the pressurized vessel (2). The second outlet conduit positioned on pressurized vessel (2) is preferably a pressurized liquid outlet conduit (6) positioned such that an amount of the liquid comprising an amount of dissolved gas can be withdrawn from the pressurized vessel (2).

Nelson et al. further disclose the employment of sensors to measure the concentration of the dissolve ozone in the water.

8. Claims 13-16, 20, 23, 29, 34-35, and 37-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Nurmi US 6,135,433.

Nurmi discloses a system and method for saturating a gas with a vapor from a liquid chemical. The system includes: (a) a saturation vessel (dissolution unit) connected to receive a liquid chemical and a carrier gas; (b) a gas sparger (bubbler) in the saturation vessel for sparging the carrier gas into the liquid chemical; (c) means for maintaining the liquid chemical in the saturation vessel at a substantially constant level; (d) means for controlling the temperature of the liquid chemical in the saturation vessel to a desired value, comprising (i) a system for cooling the liquid chemical, and (ii) a heater inside the saturation vessel extending vertically in the liquid a distance at least half of the height of the liquid chemical level for heating the liquid chemical; and (e) means for controlling the pressure of the saturated gas to a desired value. The invention also relates to novel methods and systems for controlled delivery of a vaporized liquid

chemical. The invention has particular applicability to the semiconductor manufacturing industry.

A carrier gas is delivered from a carrier gas source 102 through line 104 to a saturation vessel or bubbler 106, which contains a volatile liquid chemical. The carrier gas is bubbled through the liquid chemical in the saturation vessel 106 to form a saturated gas of desired concentration. The carrier gas source 102 can be, for example, a gas cylinder or a bulk storage vessel.

The device comprises liquid supplies 108, 110 that store the liquid chemical.

Liquid containers 108, 110 are connected through a system of tubing and valves to allow the liquid chemical to be introduced into the saturation vessel 106. The tubes used to transport the liquid chemical through the system are preferably flexible hoses constructed of Teflon lined stainless steel. Containers 108, 110 can be connected to the saturation vessel by individual lines that converge into a single line 112. Optionally, one or more additional saturation vessels can be supplied with the liquid chemical via branch lines 112', 112".

Various connections on the saturation vessel are preferably disposed at a top portion thereof. A first connection 122 is connected to the liquid supply system described above, for introducing the liquid chemical into the saturation vessel. The first connection 122 includes a manual valve V3 connected to a tube that penetrates through the top of the saturation vessel and extends nearly to the vessel bottom. Preferably, the tube extends to within a few inches of the vessel bottom. Second connection 124 is connected by tubing to the carrier gas supply 102 for introducing the carrier gas into the

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saturation vessel. Second connection 124 includes a manual valve V4 connected to a tube that penetrates through the top of the saturation vessel. The end of the tube of second connection 124 is connected to a gas dispersing structure 126 which has perforations through which the carrier gas flows and is dispersed into the liquid chemical.

Preferably, the dispersing structure 126 includes a plurality of sintered metal tubes and is disposed at or near the bottom of the saturation vessel. The gas dispersing structure permits fine bubbles to be produced in the liquid chemical to allow intimate contact between the carrier gas and the liquid chemical.

As the carrier gas is introduced into the liquid chemical, bubbles pass up through the liquid chemical, eventually becoming saturated with the chemical vapor. The saturated vapor is removed from the saturation vessel through a third connection 134 which includes a manual valve V5. The saturated vapor exiting the saturation vessel is conducted through tubing 138 to the point of use, for example, one or more semiconductor processing tools. The tubing can be divided downstream into a plurality of branch lines 140, 142 and 144 for this purpose. One of the branch lines can optionally be connected to an analytical tool, such as a concentration sensor, for verification of the saturated gas product.

The saturation vessel preferably includes a fourth connection 146 which allows one to remove any remaining liquid chemical from the vessel when the vessel is to be serviced. The fourth connection 146 includes a manual valve V6 connected to tubing

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which penetrates through the top of the saturation vessel and extends to the bottom of the vessel.

To ensure a substantially constant vapor/liquid contact time between the carrier gas and liquid chemical, it is important that the liquid chemical in the saturation vessel be maintained at a substantially constant level. The liquid level can be controlled by various means. In accordance with an exemplary aspect of the invention, the liquid content in the saturation vessel is preferably controlled by monitoring the mass or weight of the saturation vessel. For this purpose, a mass or weight scale 148 can be disposed beneath the saturation vessel to continuously measure the mass or weight of the vessel. A signal from scale 148 is sent to a controller 150 which controls operation of the liquid supply system based on the weight measurement. Controller 150 sends a signal to a valve 152 which it continuously controls the flux of liquid introduced into the saturation vessel to maintain a constant liquid level therein.

To prevent condensation of the chemical vapor in the saturated gas, the liquid chemical in the saturation vessel is cooled to a desired temperature below ambient temperature.

9. Claims 13-16, 23, 29, 34, and 38-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Ginsburgh et al. US 6,293,525.

Ginsburgh et al. disclose an efficient and economical mixing apparatus 10 for exposing a controllable and/or optimal volume of inert gas such as CO₂ to a controllable and/or optimal volume of hydrocarbon fuel (e.g. Jet fuel, Diesel fuel, engine fuels, fuel oils and the like). The mixing apparatus 10 comprise at least one mixing

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receptacle 20 (dissolution unit) suitable for the mixing of fuel 24 and inert gas 18 therein, with mixing receptacle 20 having at least one controllable fuel inlet/coupling means 32 to receive hydrocarbon fuel from a hydrocarbon fuel supply (storage tank) as directed by fuel control means 26, and at least one controllable gas inlet/coupling means 30 to receive inert gas such as CO₂ as directed by gas control means 28 from a controllable inert gas supply comprising one or more inert gas. Controllable inert gas inlet/coupling means 30 optionally includes the control means to determine fixed inert gas pressures, send pure inert gas through the mixing receptacle, and/or provide a variable range of inert gas pressures, including when appropriate, negative pressures. The device further comprises diffuser 40 (bubbler).

It is noted that fuel control means 26 can optionally be supplied by any one or more of a variety of fuel sources including fuels suppliable in various temperatures such as chilled fuel, and/or fuel otherwise optimized for inert gas absorption such as hydrocarbon fuel with additional light hydrocarbon atoms. Similarly, inert gas such as CO₂ can readily be stored in a chilled non-gaseous state e.g. liquid (cooling unit) or solid and used as an inert gas supply--including a gas supply that when expanding during phase conversion provides a naturally occurring positive pressure source.

Mixing receptacle 20 has one or more safety-enhanced or improved combustion fuel outlet/coupling means 36 (liquid discharge), which is connectable with an inert gas-enriched fuel distribution means such as outlet control means 46, to convey safety-enhanced fuel as needed. The control means 26, 28 and 46, are comprised of any one or more in a variety of known control device(s) such as automated, computer-controlled,

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or manually controlled, pump(s), valve(s), re-circulating device(s), manifold(s), and the like. Alternatively, the mixing receptacle(s) 20 can also comprise any one or more in a variety of known measuring and/or monitoring means 78, such as monitoring, measuring, reporting device(s) and/or instruments used to measure or regularly sample pressure, temperature, chemistry composition, gas concentration levels (concentration measurements), and the like, including the incorporation of monitoring means communication signal 80 with receptacle-content control means 82 (fuel control means 26, inert gas control means 28, and safety-enhanced fuel control means 46, inclusively) in order to facilitate the automation of optimal mixing of the inert gas in the hydrocarbon fuel. Communication signal 80 can be transmitted through a suitable conduit connected between monitoring means 78 and any one or more of the control means, or alternatively can be transmitted by wireless transmission, in which case monitoring means 78 and any one or more of the control means are comprised of communicating transmitter(s) and receiver(s) respectively.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

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1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

13. Claims 29, 34, 37, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nelson et al.

Nelson et al. does not specifically recite that the dissolution unit cools the chemical reagents during preparation.

However, Nelson does state that U.S. Pat. No. 5,464,480 discloses a process for removing organic materials from semiconductor wafers using ozonated water.

Specifically, this patent teaches that high ozone concentration water, suitable for use in the disclosed process may be obtained by mixing ozone and water at a temperature of from about 1 degree C to 15 degree C.

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It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Nelson to include means for cooling the mixing chamber in order to increase the amount of dissolved gases in aqueous solutions.

14. Claims 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nurmi.

As to claims 21-22, Nurmi does not specifically refer to the element that produces the bubbles within the vessel as a nozzle. However, it is obvious that the element may be referred to as a nozzle. As to the inclination of the nozzle, which is a design modification that allows for the bubbles to contact a deflection plate in the vessel to control the flow of the bubbles upward through the liquid, the examiner hereby asserts that such a structure design is well known in the art for controlling the flow of fluid in a circulation tank. For example, in aeration systems it is well known to employ "baffles" (deflection plates) to control or divert the flow or circulation of fluid in the systems.

15. Claims 20-22, 30-31, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. as applied to claims 13-15, 23, 29, 34, 37, and 38 above, and further in view of Sakamoto Naoki, JP 6-37080.

Nakajima et al. does not specifically recite that the device comprises an inclined nozzle to produce bubbles that contact a deflection plate.

Sakamoto discloses a device in which a line is used to bubbling a gas into a chemical solution for the fabrication of semiconductor wafers.

It is obvious that the line inserted in the chemical solution may be referred to as a nozzle. As to the inclination of the nozzle, which is a design modification that allows for

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the bubbles to contact a deflection plate in the vessel to control the flow of the bubbles upward through the liquid, the examiner hereby asserts that such a structure design is well known in the art for controlling the flow of fluid in a circulation tank. For example, in aeration systems it is well known to employ "baffles" (deflection plates) to control or divert the flow or circulation of fluid in the systems.

As to claim 31, it would have been obvious to one of ordinary skill in the art to purify the gas to be used in the fabrication process. For example, it is well known in the art of manufacturing semiconductors via deposition processes (such as CVD) that purified gases (free of unwanted contaminants) are used.

As to claim 36, it would have been obvious to employ a common means such as a filter to separate the gas from the solution. The process of removing a gas from a liquid by using a filter that is permeable only to gas allows for the removal of bubbles or recycling of unused gas to maintain a system that operates at a high efficiency level.

Conclusion

2. All claims are drawn to the same invention claimed in the application prior to the entry of the submission under 37 CFR 1.114 and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the application prior to entry under 37 CFR 1.114. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action after the filing of a request for continued examination and the submission under 37 CFR 1.114. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian R. Gordon whose telephone number is (703) 305-0399. The examiner can normally be reached on M-F, with 2nd and 4th F off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on 703-308-4037. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

brg
November 17, 2003


Jill Warden
Supervisory Patent Examiner
Technology Center 1700